GLAST Monthly PSR

Spacecraft

Dec. 5, 2003_March 5, 2004

Joy Bretthauer
Observatory Manager

Accomplishments

Contract Actions

- Mods for: PDR Slip, 1PPS, 1 Add'l SIIS, I&T Battery Cell Bypass, TDRSS MA; Launch Delay(#19); NTE for PRU Capacity (#20); SSR & Task Order 12 (#21)
- Invoices:
  - Approved: Tasks 4, 9, & 10
  - SIIS, 1PPS, TDRSS MA, Battery Cell Bypass Mod: Only 1out of 4 items invoiced were partially completed; invoice received prior to completion of performance;
- Negotiations completed:
  - Feb. 2004: SSR increase, Task 12 Phase 1- Solar Array Redesign
  - Dec. 2003: PDR Slip, 1PPS, 1Add'l SIIS, Battery Cell Bypass, TDRSS MA
- Special Studies released (2/04):
  - Task 14: Phase 2 Solar Array Kapton Qual
  - Task 15: Power on at Launch

Accomplishments

Contract Actions (cont'd)

- Tech Evals Completed:
  - Remove Bus Bars (project approved), TVAC Dwell Time (in-review)
  - Ku-band (In Code 200 review)
  - UCA for PRU

- Negotiations/Discussions In-progress:
  - Remove Bus Bars
  - Ku-Band
    - 2 sets of clarification questions submitted (January & early February); received 1st set of responses (January);
    - March 1, 2004: received a partial response for additional clarification; responses to 2nd set of February clarifications still outstanding;

Accomplishments

Contract Actions (cont'd):

- **Proposals Received: 15**
  - **Mar. 3, 2004: (2) Larger LAT Thermal Model, GPS**
  - **Feb. 04: (3) EMI/EMC, LAT Harness, PRU**
  - **Jan. 04: (2) *TVAC Dwell Time*, GBM Mass Increase**
  - **Dec. 03: (1) Task 13 ISMP**
  - **Nov. 03: (3) *Ku Band*, Monitor Ind Cell Voltages, LAT Flexures**
  - **Oct. 03: (4) *Remove Bus Bars*, Ops CDRL, No Grd Cmd Cell Bypass, Instrument Connector Procurement**
- **Tech Evals:**
  - **Completed: 3**
    - **Ku Band, Remove Bus Bars, TVAC Dwell**
  - **Drafts in-progress (Technical input received): 5**
    - **LAT Flexures, GBM Mass Increase, Monitor Ind. Cell Voltages, LAT Flexures, No Grd Cmd Cell Bypass**
- **Tech Evals - Technical input pending: 7**
    - **LAT Harness, Task 13 ISMP, Instrument Connectors, Larger LAT Thermal Model, GPS, EMI/EMC, GPS**

Accomplishments

- **GFE/Deliverables**
  - **Pending:**
    - **LAT FEM 10.08 for STOP Cycle 3 and CLA; 10.07 deemed not suitable due to omission of necessary updates**
    - **TURFTS**
    - **LV Drill Template**
- **CDRL Library Tool**
  - **Demonstrations held in February**
  - **Plan:**
    - **Project to Review & Approve Completed CDRLs before S/C CDR**
      - **Spectrum already received informal feedback**
    - **End-User Briefings for CDRL Point of Contacts (POCs), Reviewers, and Approvers**
  - **Library data base: population in-progress**
    - **Previous CDRL Review sheets imported (H,I, 29)**
    - **S/C SOW & MAR CDRL Descriptions entered**
    - **Received CDRLs: library import in-progress**
  - **Testing of modules to facilitate CDRL reviews: in-progress**

Accomplishments

- **EMI/EMC Test Requirements**
  - **Received EMI/EMC proposal; in techical review**
  - **Current EMI Requirement do not include Ku-band impacts; CCR to be submitted to remove X-band and insert Ku-band requirements**
- **Factory of the Future: (see pg. 71 SAI February MPSR)**
  - **GLAST FoF Review: Re-scheduled for March 17, 2004**
  - **Certificate of Occupancy received 2/10/2004**
  - **High Bays Complete; Clean Room Monitoring Certification 2/24/2004**
  - **Mechanical Handling Pathfinder Completed 2/17/2004**
  - **Acoustics Chamber: Acceptance Test Completed**

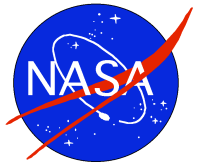
Accomplishments

- **Flight Software**
  - **Updating detailed designs to reflect Ku-band, S-band, transmit antenna switch, & downlink state machines**
  - **RAD750**
    - **DRAM: BAE estimate that RAD750 will get 2 stuck bits per year due to radiation damage;**
    - For GLAST estimate is 10 to 20 corrupt bits over 5 year lifetime, 10 year goal
    - A satellite has documented a bit error in flight to their Hitachi EEPROM; RAD750 SUROM EEPROM is also from Hitachi
    - Throughput declines dramatically with missed cache hits
- **Propulsion:**
  - **Plume Impingement: Preliminary Ku Band Plume Impingement pressures and Heat fluxes complete:**
  - **MSPSP: In-progress**
  - **Propellant tank: in acceptance vibration testing**
  - **Thruster valve design mods are under review to minimize wear**

Accomplishments:S/C Overview

- **C&DH:**
  - **Board status: *inclusive of Ku-band modifications***
    - **Engineering model Testing completed: NVM #1**
    - **Engineering models in test:**
      - **UDL EM# 1 & 2;**
      - **PACI #1,2, & 3;**
      - **GDE: #2;**
      - **PDE: EM #1 completed functional testing**
      - **ARM: in test**
      - **PDE #1: completed functional testing; auto scripts in-work (RDE will lose 1 week to test NFIRE flight board)**
      - **LGIO #1: LAT Interface successfully tested at 8 MHz; GBM Interface successfully tested at 2.0 MHzand 1.3 MHz**
      - **IPCU #1,2, 3, & 4**
    - **Re-work completed:**
      - **GDE: EM #1 Ku-band rework completed**

Accomplishments:S/C Overview



C&DH Continued…

- **BAE:**
  - **cPCI connector direction given to BAE: use ERNI connectors and increase gold plating to 100u in. ; New PWBs procurred for flight and 2 test boards to be supplied to GSFC for cross sectioning**
  - **Omnirel Regulator: instability problem; IR plans to issue a GIDEP advisory soon**
- **Resolved 10 of 1 SEAKR CDR action items**
- **Rad750 User's Group Meeting held**
- **Tracking Actel FPGA issue on post programming failures**

Accomplishments: S/C Subsystems

- **Instrument Interfaces**
  - **GBM Internal ICD signed**
  - **LAT Mechanical ICD signed**
  - **Tim Morse/Spectrum Instrument accommodation engineer attended LAT Monthly**
  - **Issue: GBM Detector radiator sizing, view factors & survival power design is inadequate**
- **EGSE:**
  - EPS EGSE Card Station Status: PRU & LCB in test; CCB – MFG drawings released; CTB ready for h/w setup
  - LAT SIIS
  - Development Plan:
    - Functional checkout of SIIS: 4/2/04
    - Install Harness & SIIS: early to mid May 2004
  - LAT Harness proposal received; in technical review;

Accomplishments: S/C Subsystems

- **LAT & GBM SIIS/SDIS Status (cont'd)**
  - **GBM SDIS: expected to ship today, March 5, 1004**
    - ***Install 3/10-3/12 or 3/15 – 3/15 – 3/17 (depending on support for peer reviews)***
- **EPS:**
  - ***EMCORE: development panel being reworked; thermal cycling to start 3/01/04***
    - ***Yuri Flom's welding suggestions being implemented***
    - ***Fred Gross' cleaning suggestions being implemented***
  - ***QTP Rework Plans: remove welds completed with low energy and replace with new bond technique and weld schedule***
  - ***Eagle Picher:***
    - ***Reviewing Cell ATP to make cell selection for I&T and Test pack batteries***
    - ***CDR re-scheduled for March 9, 2004***
  - ***Board Status: (EMs)***
    - ***In test: LCB 2 & 3;***
    - ***Completed: VRB, PIB***
    - ***Issue: FSB - new board design out for quote; current over voltage protection can only protect below 42V; different approach necessary to obtain lower voltage if required***

Accomplishments: S/C Subsystems

- **Thermal**
  - GBM Thermal Analysis: Detector design inadequate; recommendations for solution include over-sizing radiators and adding more heater power
  - GLAST IEM temperature study performed: results – current predictions are typical of other missions (currently49.8C, previously ranged from 40 to 52C); recommendation is that design not be changed now; IEM predications will be available post CDR
- **GNC**
  - Finalizing flight simulation
  - GPS receiver: per Feb. MPSR use as-is; tin whiskers are low risk
  - 2 of 3 Swift heritage, build to print, Star Trackers (ST) for GLAST failed vibe at vendor (General Dynamics);
    - **S/N 1002 & 10003 passed acceptance tests**
    - **S/N 1001 rework complete; performing acceptance testing (report from Goodrich received)**
  - Magnetometers, Reaction wheel ATP on hold pending NFIRE RW failure
- **Mechanisms**
  - Root Hinge Test: Ambient Torque Tests Complete; harness & thermal tests to be completed

Accomplishments: S/C Subsystems

Telecom

- Ku Band Transmitter and S band Switch TIM held in February @ CMC Electronics
- Incorporated Ku Band BER Test Mode Changes in hardware specs
- Reviewing EMI/EMC Test Requirements
- TURFTS: NEEDED in April to Support MMT EM – UDL Interface Testing

Structural

- Incorporated LAT FEM version 10.06 into Observatory FEM
  - LAT Interface Nodes are not centered about X,Y coordinates and DO NOT facilitate Observatory buckling analysis
- Completed Internal Review of Solar Array and Mechanism Designs
- Incorporated NaI & BGO Mass into Instrument FEM's conducting static & modal analysis
- **STOP: Cycle 2 Results – delays due to replacing a single model with several models with varying stages of maturity; model receipt dates slipped**
  - **Conducting unit gradient load cases**
  - **Supporting verification of temperature mapping to spacecraft**
  - **Combined old LAT model (10.01S) with latest s/c model, runs & results will be available on or before 12/8/03 (were not available as of Spectrum's MPSR)**

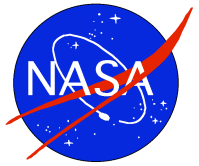
Accomplishments: FoF

- FoF Readiness Review Plan: (see chart #74 SAI Feb. MPSR)
  - **1st GLAST FoF Review 3/17/04**
  - **Initial Draft of Capabilities Document was to be released in December; should be available for GLAST FoF review**
  - **FoF Certification/Acceptance Plan**
    - **TVAC Chamber: 1/27/04 to 2/26/04**
    - **Acoustics Chamber: 1/27/04 to 2/9/04**
    - **EMI/EMC Chamber: 1/14/04 to 4/29/04**
    - **Clean Room: Certification by outside 3rd party; 1/2/04 to 1/23/04**
    - **Crane Proof Load: Arizona Dept. of Weights & Measures to conduct Proof Load Tests; 1/27/04 to 1/30/04**

Issues

- ***36 SOW CDR requirements: 7 items are significantly affected by CLA/STOP results;***
- ***Cost/schedule/technical impacts may result from hardware build based on pre-mature instrument models. If hardware build starts after CDR, risk of mods to hardware to accommodate results of true, CDR instrument & S/C models after final Coupled Loads Cycle is complete.***
  - *CLA cycles 1 & 2 are based on PDR-version of LAT FEM*
  - *At least 7 revisions of LAT FEM since PDR-version*
  - *Interface loads have increased 30%*
  - *Primary load path of LAT to S/C interface changed significantly*
  - *L/V CLA Forcing Functions are scaled, results not yet available*

UPCOMING SUBSYSTEM OR INTERFACE MEETINGS



- ***Mar 23, 2004 APM TIM2 (CDR) – POC Igor Lazbin***
- ***Week of Mar 29 PRU Roadshow @SLAC, POC Tim Morse***
- ***EPS Review Power Bus Short Mini-Peer Review @Spectrum, POC Robb Pinkerton***
- ***June 8, 2004 Ku-Band Antenna TIM @ CMC, POC Mark Carlson***

Subcontract Review Rules of Engagement

We Can Discuss Requirements Compliance and Clarifying Questions
We Can Not Direct Outside of the Subcontract
We Can Not Ask for Design Alternatives

Issues

- *EMI/EMC Test Requirements: 2/24/2004 - Proposal received and in review; CCR approved and Spectrum guidance for SSR provided before 12/10/02 as requested;*
- *RAD750: radiation, performance reduction*
- *Solar Array Diode Weld: failed vibe test, currently checking each weld to determine cause of failure; plan to correct low energy welds by removing & replacing them*
- *Solar Array Atomic Oxygen Kapton Issue: 2 mil baseline used for CDR; results of 5 mil to be presented; 5 mil incorporated into baseline after testing of coupons and qual program is outlined*
- *LAT SIIS /harness: see previous charts*
- *LAT Power: Closed.*
- *Hiatus period activities: direction to Spectrum on-hold until detailed schedule is updated and analyzed to determine length of hiatus after impacts due to instrument delays, CDR slip, Ku-band, ISMP, and launch date are assessed*
- *GPS Antenna: Proposal submitted. per GLAST systems, working solution with Spectrum to extend lifetime due to thermal CTE mismatch*
- *LAT Data Rate Increase: CLOSED. additional memory modules can be added to SSR; ground systems & operational impacts under review*

Rolling Wave Schedule

- ***Spectrum Astro created a Spacecraft summary schedule which includes impacts associated with Ku-band, launch, and CDR; reviewed at Spectrum's February MPSR***
  - *GLAST Project Schedule updated on March 4, 2004 based on spacecraft summary schedule*
- ***Spacecraft's detailed schedule, which is used to generate the Rolling Wave Schedule, is being updated to reflect the Spacecraft summary schedule***
  - *SC CDR: 5/24/2004 – 5/27/2004*
  - *Flight Structural Tests: 9/3/04 – 11/2004*
  - *Bus I&T: 12/14/2004 - 8/12/05*
  - *End Bus I&T to start Obs I&T: 8/12/05 – 11/15/05*
  - *GBM delivery: 11/15/2005*
  - *LAT delivery: 12/21/2005*
  - *Observatory I&T: 11/15/2005 – 8/25/2006*
  - *Ship to Launch Site: 12/19/2006*
  - *Launch: 2/28/2007*